In the claims

Cancel claims 1-20.

21. (New) A neo-cartilage construct for *in situ* implantation into a cartilage lesion, said construct comprising:

a cultured differentiated autologous or heterologous chondrocytes or cells that could be differentiated into chondrocytes; and

a support matrix;

wherein said chondrocytes or cells are incorporated into said support matrix suspended in a suspension fluid and propagated within said matrix using an algorithm comprising subjecting said chondrocytes or cells incorporated into said matrix to a cyclic or constant hydrostatic pressure from about zero to about 10 MPa at from about 0.01 to about 2 Hz, to an atmospheric pressure or to non-pressure conditions, for from about 1 hour to about 24 hours a day, for about 1 to about 90 days, at an oxygen concentration from about zero to about 20% and a carbon dioxide concentration of from about zero to about 5%.

22. (New) The construct of claim 21 wherein said support matrix is a sponge, a porous scaffold, a honeycomb or a hydrogel prepared from a material selected from the group consisting of a Type I collagen, a Type II collagen, a Type IV collagen, a cell-contracted collagen containing proteoglycan, a cell-contracted collagen containing glycosaminoglycan, a cell-contracted collagen containing a glycoprotein, gelatin, agarose, hyaluronin, fibronectin, laminin, a bioactive peptide, a growth factor,

cytokine, a synthetic polymeric fiber made of a polylactic acid, a synthetic polymeric fiber made of a polyglycolic acid, a synthetic polymeric fiber made of a polyamino acid, polycaprolactone, a polyamino acid, a gel, a sol-gel, a thermo-reversible gelation hydrogel (TRGH), a copolymer thereof, and a combination thereof.

23. (New) The construct of claim 22 wherein said support matrix is a composite combination of a sponge and porous scaffold, a sponge and hydrogel or a porous scaffold and hydrogel.

24. (New) The construct of claim 23 wherein said support matrix is prepared from the TRGH.

25. (New) The construct of claim 24 wherein the hydrostatic pressure is cyclic or constant.

26. (New) The construct of claim 25 wherein the hydrostatic pressure is from about 0.01 MPa to about 10 MPa above atmospheric pressure at about 0.01 to about 1 Hz, wherein the time for applying the hydrostatic pressure is from zero to about 24 hours per day for from about one day to about ninety days, wherein said hydrostatic pressure is preceded or followed by a period of zero to about 24 hours per day of a static atmospheric pressure for from zero day to about ninety days and wherein the oxygen concentration is from about 1 to about 20%.

27. (New) The construct of claim 26 wherein the hydrostatic cyclic pressure is from about 0.05 MPa to about 3 MPa at 0.1 to about 0.5 Hz or constant pressure is from about zero to about 3 MPa

above atmospheric pressure and wherein such pressure is applied for about 7 to about 28 days.

28. (New) The construct of claim 26 wherein said hydrostatic pressure is preceded or followed by a period of about one to about 28 days of atmospheric pressure.

29. (New) The construct of claim 28 wherein said chondrocytes are autologous.

30. (New) The construct of claim 28 wherein said chondrocytes are heterologous.

31. (New) The construct of claim 28 wherein said support matrix is perfused with a medium at a rate of a medium perfusion from about 1 μL/min to about 500 μL/min.

32. (New) A three-dimensional neo-cartilage construct suitable for *in situ* implantation into a cartilage lesion, comprising:

a support matrix structure incorporated with isolated chondrocytes or cells capable of differentiation into chondrocytes harvested from a donor cartilage, cultured, expanded and suspended in a suspension fluid and propagated within said suppport matrix into said three-dimensional neo-cartilage construct using an algorithm of the invention,

wherein said algorithm comprises subjecting said chondrocytes or cells to a cyclic or constant hydrostatic pressure from about zero to about 10 MPa at from about 0.01 to about 1 Hz, to atmospheric pressure or to non-pressure conditions, for from about

1 to about 24 hours a day for about 1 to about 90 days at a rate of a medium perfusion from zero to about 500 µL/min at an oxygen concentration from zero to about 20% and a carbon dioxide concentration from zero to about 5%.

33. (New) The construct of claim 32 wherein said chondrocytes or cells are suspended in the suspension fluid and incorporated into said support matrix structure at a cell density from below 3 to about 12 millions/mL of the suspension fluid.

34. (New) The construct of claim 33 wherein the support matrix structure is prepared from a material selected from the group consisting of a Type I collagen, a Type II collagen, a Type IV collagen, a cell-contracted collagen containing a proteoglycan, a cell-contracted collagen containing a glycosaminoglycan, a cell-contracted collagen containing a glycoprotein, gelatin, agarose, hyaluronin, laminin, a bioactive peptide growth factor, a cytokine, a synthetic polymeric fiber made of a polylactic acid, a synthetic polymeric fiber made of a polyglycolic acid, a synthetic polymeric fiber made of a polyamino acid, polycaprolactone, a gel, a hydrogel, a sol-gel, a thermo-reversible gelation hydrogel (TRGH), a copolymer thereof and a combination thereof.

35. (New) The construct of claim 34 wherein said support matrix structure is prepared from the Type I collagen, Type II collagen or Type IV collagen, or from the gel, sol-gel or the TRGH.

36. (New) The construct of claim 35 wherein said support matrix structure is prepared from Type I collagen, Type II collagen

or Type IV collagen and freeze-dried or lyophilized into a collagen sponge, porous scaffold or a honeycomb.

37. (New) The construct of claim 36 wherein said support matrix structure is prepared from the gel, sol-gel or thermo-reversible gelling hydrogel (TRGH).

38. (New) The construct of claim 37 wherein said suport matrix structure is a composite combination of the hydrogel and the collagen sponge, hydrogel and the porous scaffold, the TRGH and the collagen sponge, the TRGH and the porous scaffold, the hydrogel and the honeycomb and the TRGH and the honeycomb.

39. (New) The construct of claim 38 wherein said suspension fluid for said cultured and expanded chondrocytes is the gel, the sol-gel or the TRGH and wherein said chondrocytes are incorporated into said support matrix suspended in said suspension fluid.

40. (New) The construct of claim 39 wherein the support matrix is the collagen sponge, the porous scaffold or the honeycomb and wherein said chondrocytes or said cells are incorporated into said sponge in the TRGH suspension fluid.

41. (New) The construct of claim 40 wherein the support matrix construct has pores from about 50 μm to about 500 μm.

42. (New) The construct of claim 41 wherein the support matrix construct has pores from about 100 μm to about 300 μm.